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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
08/897,839	07/21/1997	YUHKO NISHIMOTO		4968

30132 7590 04/07/2003

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EXAMINER

MALDONADO, JULIO J

ART UNIT

PAPER NUMBER

2823

DATE MAILED: 04/07/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	08/897,839	NISHIMOTO ET AL.	
	Examiner	Art Unit	
	Julio J. Maldonado	2823	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED. (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 28 January 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 43 and 47 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 43 and 47 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s) _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ 6) ☐ Other:

DETAILED ACTION

1. The non-final rejection as set forth in paper No.34 is withdrawn in response to applicants' amendments.
2. A new rejection is made as set forth in this Office Action.
3. Claims 43 and 47 are pending in the application.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claim 43 is rejected under 35 U.S.C. 103(a) as being unpatentable over Itoh et al. (U.S. 5,160,998) in view of Machado et al. (U.S. 5,098,865).

Itoh et al. (Figs.6 and 8a-h' and column 3, line 56 – column 8, line 18) in a related art to the formation of metal wirings teach forming a first insulating layer (43) with compressive stress; forming an aluminum interconnection layer (34) on and in contact with said first insulating layer (43); forming a second insulating layer (44) with compressive stress on and in contact with said interconnection layer (34), wherein said interconnection layer (34) is sandwiched between and in contact with said first insulating layer (43) and said second insulating layer (44) and wherein the total stress in said insulating layers is limited to less than 2×10^6 dyne/cm so as to suppress bending of said interconnection layer (34); and before forming said first insulating layer (43) or after

forming said second insulating layer (44), forming a third insulating layer (42) with a second type of stress that is different from said first type of stress, so as to adjust overall stress of said stress-adjusted insulating film, wherein the stress-adjusted insulating film has first through i-th insulating layers having the thickness t_1 through t_i , respectively, and wherein the stress in said insulating film is positive when tensile stress and negative when compressive stress (column 4, lines 46 – 62).

Itoh et al. fail to teach wherein the thickness (t_i) of i-th insulating layer of said stress-adjusted film is determined so as not to exceed stress (σ_T) of said overall stress-adjusted insulating film where said stress (σ_T) is calculated as:

$$\sigma_T = \sum_{i=1}^n (t_i X \sigma_i)$$

However, Machado et al. in a related method to deposit a dielectric layer teach that the stress of a film depends on the film thickness, deposition rate, deposition temperature, among other parameters (column 2, lines 59 – 65). Therefore, it would have been obvious to one of ordinary skill in the art at the invention was made to include the parameters as taught by Machado et al. and determine a thickness (t_i) of i-th insulating layer of a stress-adjusted film is determined so as not to exceed stress (σ_T) of said overall stress-adjusted insulating film in the invention as taught by Itoh et al., since this would further help to prevent cracking in the insulating layer of Itoh et al. (column 2, lines 50 – 58).

Still, the combined teachings of Itoh et al. and Machado et al. fail to expressly teach that the stress (σ_T) is of said stress-adjusted insulating film calculated as:

$$\sigma_i = \sum_{j=1}^n (t_j X \sigma_j)$$

However, this equation is inherent because it's a description of the relationship between the stress of the films governed by the physics and material properties. One of ordinary skill in the art would have been able to recite the relationship between the stress value for the i-th layer, because is routine optimization within the combined teachings of Itoh et al. and Machado et al.

6. Claim 47 is rejected under 35 U.S.C. 103(a) as being unpatentable over Itoh et al. ('998) in view of Machado et al. ('865) as applied to claim 43 above, and further in view of Matsuura et al. (U.S. 5,250,468).

The combined teachings of Itoh et al. and Machado et al. teach forming the first insulating layer (43) by plasma CVD process, and the second insulating film (44) by reactive gaseous mixtures (Itoh et al., column 4, lines 13-41), but fail to teach the reactive gaseous mixtures include at least organic silane and oxygen. However, Matsuura et al. in a related method to form insulating films teach forming dielectric layers using plasma CVD processes and organic silane and oxygen and reactive mixture (column 1, lines 10-32). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to form the dielectric layers of Itoh et al. with a gaseous mixture including at least organic silane and oxygen as taught by Matsuura et al., since this materials are commonly used to form dielectric layers (column 1, lines 10-32).

Response to Arguments

7. Applicant's arguments with respect to claim 43 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

8. Papers related to this application may be submitted directly to Art Unit 2823 by facsimile transmission. Papers should be faxed to Art Unit 2823 via the Art Unit 2823 Fax Center located in Crystal Plaza 4, room 3C23. The faxing of such papers must conform to the notice published in the Official Gazette, 1096 OG 30 (15 November 1989). The Art Unit 2823 Fax Center number is **(703) 305-3432**. The Art Unit 2823 Fax Center is to be used only for papers related to Art Unit 2823 applications.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to **Julio J. Maldonado** at **(703) 306-0098** and between the hours of 8:00 AM to 4:00 PM (Eastern Standard Time) Monday through Friday or by e-mail via julio.maldonado@uspto.gov. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri, can be reached on (703) 306-2794.

Any inquiry of a general nature or relating to the status of this application should be directed to the **Group 2800 Receptionist** at **(703) 308-0956**.

JMR
3/27/03


George Fournon
Primary Examiner